Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL GUIDELINE CLEARINGHOUSE

# General

## Guideline Title

Cough in the athlete: CHEST guideline and Expert Panel report.

## Bibliographic Source(s)

Boulet LP, Turmel J, Irwin RS, CHEST Expert Cough Panel. Cough in the athlete: CHEST guideline and Expert Panel report. Chest. 2017 Feb;151(2):441-54. [76 references] PubMed

## Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

# NEATS Assessment

National Guideline Clearinghouse (NGC) has assessed this guideline's adherence to standards of trustworthiness, derived from the Institute of Medicine's report Clinical Practice Guidelines We Can Trust.

= Poor = Fair = Good = Very Good = Excellent

| Assessment | Standard of Trustworthiness |
|---|---|
| YES | Disclosure of Guideline Funding Source |
| | Disclosure and Management of Financial Conflict of Interests |
| | Guideline Development Group Composition |
| YES | Multidisciplinary Group |
| UNKNOWN | Methodologist Involvement |
| | Patient and Public Perspectives |

| | |
|---|---|
| | Use of a Systematic Review of Evidence |
| ▮▮▮▮▮ | Search Strategy |
| ▮▮▮▮▮ | Study Selection |
| ▮▮▮▮▮ | Synthesis of Evidence |
| | Evidence Foundations for and Rating Strength of Recommendations |
| ▮▮▮▮▯ | Grading the Quality or Strength of Evidence |
| ▮▮▮▯▯ | Benefits and Harms of Recommendations |
| ▮▮▮▮▮ | Evidence Summary Supporting Recommendations |
| ▮▮▮▮▯ | Rating the Strength of Recommendations |
| ▮▮▮▮▮ | Specific and Unambiguous Articulation of Recommendations |
| ▮▯▯▯▯ | External Review |
| ▮▯▯▯▯ | Updating |

# Recommendations

## Major Recommendations

The grades of recommendation (1A–2C, consensus-based [CB]) and the approach to rating the quality of evidence are defined at the end of the "Major Recommendations" field.

In adult and adolescent athletes (≥12 years of age) complaining of acute or recurrent cough, the Expert Panel suggests to initially evaluate for the most commonly reported causes of cough in this group such as asthma, exercise induced bronchoconstriction (EIB), respiratory tract infections (RTIs), upper airway cough syndrome (UACS) due to rhinosinus conditions, and environmental exposures related to the sport training environments (Ungraded, Consensus Based).

In adult and adolescent athletes (≥12 years of age) complaining of acute or recurrent cough, the Expert Panel suggests that pulmonary function tests, particularly bronchoprovocation challenges, and assessment of allergy to common airborne allergens be performed in the investigation of cough to identify common etiologies such as asthma and EIB, and to evaluate the effects of environmental exposures such as allergens, respiratory irritants, and pollutants (Grade 2B).

In adult and adolescent athletes (≥12 years of age) complaining of acute or recurrent cough, the Expert Panel suggests to proceed with a systematic investigation based on suspected cause(s) from initial clinical assessment, with specific attention to the athlete's particular sport and training environment and context (exercise related or not) in which cough occurs, to determine its etiology (Ungraded, Consensus Based).

In adult and adolescent athletes (≥12 years of age) complaining of cough, the Expert Panel suggests a treatment trial directed at the suspected causes of cough similarly to the general population, but taking into account the sport performed and training environment. The anti-doping regulations and potential side effects of medications that could interfere with training performances should be reviewed and considered when appropriate (Ungraded, Consensus Based).

Remarks: Anti-doping regulations are provided by the World Anti-Doping Agency (WADA) (https://www.wada-ama.org ). The World Anti-Doping Code is a document that brings consistency to anti-doping rules, regulations, and policies worldwide. It is updated annually and the Prohibited List identifies the substances and methods prohibited to athletes in and out of competition. The Global Drug Reference Online (Global DRO) provides athletes and support personnel with information about the prohibited status of specific substances based on the current WADA Prohibited List. The Global DRO provides specific information on products sold in the United Kingdom, Canada, and the United States. The Global DRO is created through a partnership between UK Sport, the Canadian Centre for Ethics in Sport, and the US Anti-Doping Agency (http://www.globaldro.com/Home ).

In adult and adolescent athletes (≥12 years of age) complaining of acute and recurrent cough, the Expert Panel suggests that investigators perform randomized control trials to assess the effects of disease-specific and/or environment-specific (e.g., cold-air-induced cough) treatments on cough because there are minimal data on how to optimally treat cough in these groups (Ungraded, Consensus Based).

Definitions

American College of Chest Physicians (CHEST) Grading System

| Grade of Recommendation | Balance of Benefit vs. Risk and Burdens (Strength of the Recommendation: Level 1 or 2) | Methodologic Strength of Supporting Evidence (Quality of Body of Evidence: A, B, C, or CB) | Implications |
|---|---|---|---|
| Graded evidence-based guideline recommendations | | | |
| Strong recommendation, high-quality evidence (1A) | Benefits clearly outweigh risk and burdens or vice versa | Consistent evidence from randomized controlled trials (RCTs) without important limitations or exceptionally strong evidence from observational studies | Recommendation can apply to most patients in most circumstances. Further research is very unlikely to change confidence in the estimate of effect. |
| Strong recommendation, moderate-quality evidence (1B) | Benefits clearly outweigh risk and burdens or vice versa | Evidence from RCTs with important limitations (inconsistent results, methodologic flaws, indirect or imprecise), or very strong evidence from observational studies | Recommendation can apply to most patients in most circumstances. Higher-quality research may well have an important impact on confidence in the estimate of effect and may change the estimate. |
| Strong recommendation, low- or very-low-quality evidence (1C) | Benefits clearly outweigh risk and burdens or vice versa | Evidence for at least one critical outcome from observational studies, case series, or from RCTs with serious flaws or indirect evidence | Recommendation can apply to most patients in many circumstances. Higher-quality research is likely to have an important impact on confidence in the estimate of effect and may well change the estimate. |
| Weak recommendation, high-quality evidence (2A) | Benefits closely balanced with risks and burden | Consistent evidence from RCTs without important limitations or exceptionally strong evidence from observational studies | The best action may differ depending on circumstances or patient's or societal values. Further research is very unlikely to change confidence in the estimate of effect. |
| Weak recommendation, moderate-quality evidence (2B) | Benefits closely balanced with risks and burden | Evidence from RCTs with important limitations (inconsistent results, methodologic flaws, indirect or imprecise) or | Best action may differ depending on circumstances or patient's or societal values. Higher-quality research may well have an important impact on confidence |

| Grade of Recommendation | Balance of Benefit vs. Risk and Burdens (Strength of the Recommendation; Level 1 or 2) | Methodologic Strength of Supporting Evidence (Quality of Body of Evidence: A, B, C, or CB) | Implications |
|---|---|---|---|
| | | very strong evidence from observational studies | in the estimate of effect and may change the estimate. |
| Weak recommendation, low- or very-low-quality evidence (2C) | Uncertainty in the estimates of benefits, risks, and burden; benefits, risk, and burden may be closely balanced | Evidence for at least one critical outcome from observational studies, case series, or RCTs, with serious flaws or indirect evidence | Other alternatives may be equally reasonable. Higher-quality research is likely to have an important impact on confidence in the estimate of effect and may well change the estimate. |
| Nongraded consensus-based suggestions | | | |
| Consensus-based (CB) | Uncertainty due to lack of evidence but expert opinion that benefits outweigh risk and burdens or vice versa | Insufficient evidence for a graded recommendation | Future research may well have an important impact on confidence in the estimate of effect and may change the estimate. |

## Clinical Algorithm(s)

None provided

# Scope

## Disease/Condition(s)

Acute or recurrent cough

## Guideline Category

Diagnosis

Evaluation

Treatment

## Clinical Specialty

Allergy and Immunology

Family Practice

Internal Medicine

Pediatrics

Pulmonary Medicine

Sports Medicine

## Intended Users

Advanced Practice Nurses

Nurses

Physician Assistants

Physicians

## Guideline Objective(s)

- To assess the following in the target population: (1) the main causes of acute and recurrent cough, either exercise-induced or not, (2) how cough is assessed, and (3) how cough is treated in this population
- To make specific recommendations or suggestions about identification of the cause of cough as well as the assessment and treatment of cough in the target population

## Target Population

Adult and adolescent athletes (aged ≥12 years) who complain of acute or recurrent cough, regardless of the duration and relationship to exercise

## Interventions and Practices Considered

1. Evaluation for the most commonly reported causes of cough in this group (asthma, exercise-induced bronchoconstriction, respiratory tract infections, upper airway cough syndrome due to rhinosinus conditions, and environmental exposures related to the sport training environment)
2. Pulmonary function tests (bronchoprovocation challenge)
3. Assessment of allergy to common airborne allergens
4. Treatment trial directed at the suspected causes of cough, while being mindful of anti-doping regulations and potential side effects of medications

## Major Outcomes Considered

- Diagnostic accuracy (e.g., sensitivity, specificity, positive predictive value, negative predictive value, validity, reliability, responsiveness, feasibility)
- Therapeutic efficacy (e.g., change in clinical practice, impact on patient or provider decision-making)
- Patient outcome efficacy (e.g., acceptability, quality of life, chest pain, depression, or anxiety)

# Methodology

## Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

## Description of Methods Used to Collect/Select the Evidence

Search Strategy

Systematic review of the literature was performed. Studies published in PubMed, Scopus, and the Cochrane Library were identified using the following search terms: (cough OR exercise induced asthma OR rhinitis OR sinusitis OR laryngitis OR GERD OR gastro-esophageal reflux OR gastroesophageal reflux OR

"chronic eosinophilic bronchitis" OR bronchoconstriction OR "environmental exposures" OR "vocal cord" OR "upper airway diseases" OR allergies) AND (athlete OR athletes OR skiers OR skiing OR swimmers OR swimming OR runners OR rowing OR marathon OR Olympic OR "competitive sports") were identified. The search was limited to articles in French and English; it began with the initiation of these databases and ended in April 2015.

Study Selection

Being aware that there were only a few clinical trials on cough in the athlete, the Expert Panel included all types of study designs in the list of articles to review. References of included studies were searched to identify additional relevant publications. The study characteristics and inclusion/exclusion criteria were selected from the patient problem or population, intervention, comparison, and outcome (PICO) elements for all key clinical questions (see Table 1 in the original guideline document). To be included, studies had to meet the following criteria: subjects were described as athletes, adults and adolescents aged ≥12 years who complained of acute or recurrent cough, regardless of the duration and relationship to exercise. A subject was considered an athlete if he/she participated in an organized team or individual sport and took part in regular sport competitions against other athletes. Ideally, the sport had to require some form of systematic and usually intense training, regardless of the level of competition or number of training hours.

Two authors independently analyzed the titles and content of the abstracts recovered to assess inclusion criteria. From the selected titles and abstracts, full reports about potentially relevant studies were obtained, and the authors independently assessed eligibility of the studies. Disagreements were discussed and resolved by consensus. A third author was available to help resolve disagreements if necessary.

## Number of Source Documents

Of 1,283 references identified by the search string and screened, 60 articles were included in the analysis. The process of study selection is outlined in Figure 1 (Preferred Reporting Items for Systematic Reviews flow diagram for the study selection) in the original guideline document.

## Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

## Rating Scheme for the Strength of the Evidence

The quality of evidence was based on risk of bias, inconsistency, indirectness, reporting bias, and imprecision. The quality of evidence (i.e., the confidence in estimates) was rated as high (A), moderate (B), and low or very low (C) (see the "Rating Scheme for the Strength of the Recommendations" field).

## Methods Used to Analyze the Evidence

Meta-Analysis

Systematic Review with Evidence Tables

## Description of the Methods Used to Analyze the Evidence

Data Extraction and Quality Assessment

For randomized controlled trials, the reviewers independently assessed the risk of bias criteria using

criteria in the Cochrane Reviews. The criteria used were random sequence generation (selection bias), allocation concealment (selection bias), blinding of participants and personnel (performance bias) to the study protocol, blinding of outcome assessment (detection bias), incomplete outcome data (attrition bias), and selective reporting (reporting bias). Quality assessment of observational studies was also performed.

Guideline Framework

Grading of recommendations/suggestions was made according to the Grading of Recommendations Assessment, Development and Evaluation framework as adopted by CHEST. This framework separates the process of rating the quality of evidence from that of determining the strength of the recommendation.

## Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

## Description of Methods Used to Formulate the Recommendations

Guideline Framework

Grading of recommendations/suggestions was made according to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework as adopted by CHEST. This framework separates the process of rating the quality of evidence from that of determining the strength of the recommendation. The quality of evidence was based on risk of bias, inconsistency, indirectness, reporting bias, and imprecision. The quality of evidence (i.e., the confidence in estimates) was rated as high (A), moderate (B), and low or very low (C). The strength of recommendation was determined based on the quality of evidence and the balance of benefits and harms, patients' values and preferences, and availability of resources. Level 1 represented strong recommendations in which benefits or harms clearly outweighed the other. Level 2 represented a weak recommendation in which it was not clear that the benefits outweighed the harms (or vice versa), and new research could change the direction or strength of these recommendations (see the "Rating Scheme for the Strength of the Recommendations" field).

Developing Recommendations/Suggestions

To be included in this guideline, a recommendation or suggestion had to be voted on by 75% of the eligible members of the entire Cough Expert Panel and achieve ratings of "strongly agree" or "agree" by 80% of the voting panelists. No cough panel member was excluded from voting.

## Rating Scheme for the Strength of the Recommendations

American College of Chest Physicians (CHEST) Grading System

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| Strong recommendation, low- or very-low-quality evidence (1C) | Benefits clearly outweigh risk and burdens or vice versa | Evidence for at least one critical outcome from observational studies, case series, or from RCTs with serious flaws or indirect evidence | Recommendation can apply to most patients in many circumstances. Higher-quality research is likely to have an important impact on confidence in the estimate of effect and may well change the estimate. |
| Weak recommendation, high-quality evidence (2A) | Benefits closely balanced with risks and burden | Consistent evidence from RCTs without important limitations or exceptionally strong evidence from observational studies | The best action may differ depending on circumstances or patient's or societal values. Further research is very unlikely to change confidence in the estimate of effect. |
| Weak recommendation, moderate-quality evidence (2B) | Benefits closely balanced with risks and burden | Evidence from RCTs with important limitations (inconsistent results, methodologic flaws, indirect or imprecise) or very strong evidence from observational studies | Best action may differ depending on circumstances or patient's or societal values. Higher-quality research may well have an important impact on confidence in the estimate of effect and may change the estimate. |
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| Nongraded consensus-based suggestions | | | |
| Consensus-based (CB) | Uncertainty due to lack of evidence but expert opinion that benefits outweigh risk and burdens or vice versa | Insufficient evidence for a graded recommendation | Future research may well have an important impact on confidence in the estimate of effect and may change the estimate. |

## Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

## Method of Guideline Validation

Not stated

## Description of Method of Guideline Validation

Not applicable

# Evidence Supporting the Recommendations

## Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

# Benefits/Harms of Implementing the Guideline Recommendations

## Potential Benefits

The guideline aimed to provide specific recommendations or suggestions about identification of the cause of cough as well as the assessment and treatment of cough in this population. It was suggested that evaluation and management of cough in athletes should take into account many specific characteristics and special considerations for athletes, such as daily training, training environment, doping regulations, and frequent traveling. As each cause of cough might have a specific treatment, accurate diagnosis is essential to avoid using unnecessary medication.

## Potential Harms

Medication side effects

# Qualifying Statements

## Qualifying Statements

Disclaimer

American College of Chest Physician (CHEST) guidelines are intended for general information only, are not medical advice, and do not replace professional medical care and physician advice, which always should be sought for any medical condition. The complete disclaimer for this guideline can be accessed at http://www.chestnet.org/Guidelines-and-Resources .

Strengths and Limitations

Even though cough is a very commonly reported respiratory symptom in athletes, analysis of the literature stresses the paucity of data on cough in the athlete. The strengths of this analysis include the extensive review of > 1,200 publications obtained according to the key words selected, the methodology used to perform the analysis, and its review by the CHEST Expert Cough Panel.

Its limitations are associated with the lack of high quality studies, the variable definition of an athlete among reports (resulting in a relatively heterogeneous group of athletes), the lack of specific analysis of cough among other types of respiratory symptoms, and the variable outcomes chosen to assess cough response to treatment. In addition, the number of patients enrolled in the studies was small.

# Implementation of the Guideline

## Description of Implementation Strategy

An implementation strategy was not provided.

## Implementation Tools

Mobile Device Resources

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

# Institute of Medicine (IOM) National Healthcare Quality Report Categories

## IOM Care Need

Getting Better

Living with Illness

## IOM Domain

Effectiveness

Patient-centeredness

# Identifying Information and Availability

## Bibliographic Source(s)

Boulet LP, Turmel J, Irwin RS, CHEST Expert Cough Panel. Cough in the athlete: CHEST guideline and Expert Panel report. Chest. 2017 Feb;151(2):441-54. [76 references] PubMed

## Adaptation

Not applicable; the guideline was not adapted from another source.

## Date Released

2017 Feb

## Guideline Developer(s)

American College of Chest Physicians - Medical Specialty Society

## Source(s) of Funding

The authors have reported to CHEST that no funding was received for this study.

The American College of Chest Physicians was the sole supporter of these guidelines, the *CHEST* journal article, and the innovations addressed within.

## Guideline Committee

CHEST Expert Cough Panel

## Composition of Group That Authored the Guideline

*Panel Members*: Louis-Philippe Boulet, MD, FCCP; Julie Turmel, PhD; and Richard S. Irwin, MD, Master FCCP

## Financial Disclosures/Conflicts of Interest

Financial/Nonfinancial Disclosures

L-P. B. has received nonprofit grants for research funding provided to the Institut universitaire de cardiologie et de pneumologie de Québec for participating in multicenter studies from Altair, Amgen, Asmacure, AstraZeneca, Boehringer Ingelheim, Boston Scientific, Genentech, GlaxoSmithKline, Novartis, Ono Pharma, Sanofi, and Wyeth and support for investigator-generated studies from Takeda, Merck, and Boehringer Ingelheim; has served on consulting/advisory boards for AstraZeneca and Novartis; has received nonprofit grants for production of educational materials from AstraZeneca, GlaxoSmithKline, Merck Frosst, Boehringer Ingelheim, and Novartis; has received lecture fees from AstraZeneca, GlaxoSmithKline, Merck, and Novartis; has received travel sponsorship to meetings for presentation of studies and for committees from Novartis and Takeda. Although R. S. I. is the Editor in Chief of *CHEST*, the review and all editorial decisions regarding this manuscript were made independently by others. None declared (J. T., R. S. I.)

## Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

## Guideline Availability

Available from the CHEST Journal Web site. Also available to CHEST Journal subscribers through the CHEST app for iPhone, iPad, and iPod Touch.

## Availability of Companion Documents

The following is available:

> Lewis SZ, Diekemper RL, Ornelas J, Casey KR. Methodologies for the development of CHEST guidelines and Expert Panel reports. Chest. 2014 Jul;146(1):182-92. Available from the CHEST Journal Web site.

## Patient Resources

None available

## NGC Status

This NGC summary was completed by ECRI Institute on May 4, 2017.

This NEATS assessment was completed by ECRI Institute on June 6, 2017. The guideline developer agreed to not review the content.

## Copyright Statement



# Disclaimer

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